

FTH-7005

SERVICE MANUAL

This booklet contains supplemental technical information related to the FTH-7005 for use with the FTH-7005 Operating Manual. Service or repairs to the FTH-7005 transceiver should be performed by qualified technicians only.

YAESU MUSEN CO., LTD.

C.P.O. BOX 1500

TOKYO, JAPAN

IMPORTANT NOTE

Any adjustments to the FTH-7005 which affect the transmitter characteristics or operating frequency must be performed only by an FCC licensed technician holding a Second Class (or higher) certificate.

Copyright © 1987
Yaesu Musen Company, Ltd.
All Rights Reserved

No portion of this manual may be reproduced in any form without written permission of Yaesu Musen Co., Ltd.

FTH-7005

SERVICE MANUAL



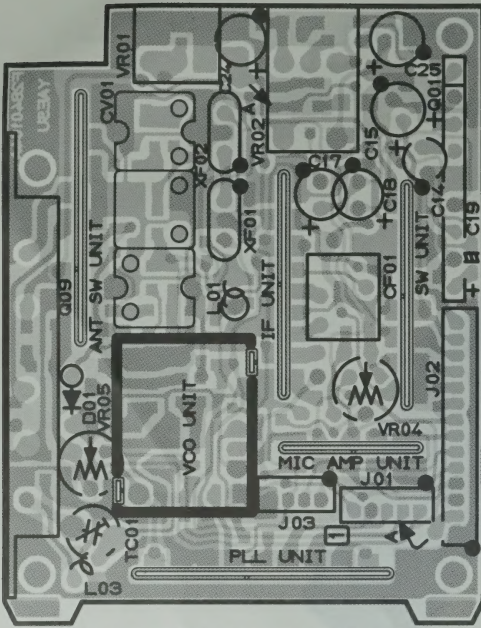
This manual is intended to serve as a supplement to the FTH-7005 Operating Manual. Detailed information regarding functions, specifications, options and operation has been provided in the Operating Manual, and is not reprinted herein. Therefore, this supplement is not intended to serve as an independent reference, but to be used in conjunction with the information provided in the Operating Manual.

Because of the compactness and complexity of the double-sided glass-epoxy circuit boards used in the FTH-7005 four layout diagrams are provided for each board. Each side of the board is identified by the type of the majority of components installed on that side. In most cases one side has only chip components, and the other has either a mixture of both chip and lead components (trimmers, coils, electrolytic capacitors, packaged ICs, etc.), or lead components only. The two "obverse" views depict the board as it is seen when viewed directly with the eye, while the two "reverse" views depict the unseen side of the board as it would appear if one were to peer through the board from the other side without seeing the components and tracks on the near side.

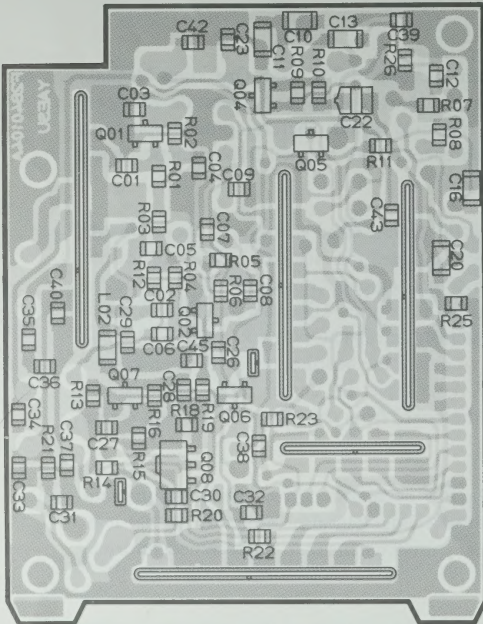
While we believe the technical information in this manual is correct, Yaesu assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Yaesu Musen reserves the right to make changes in the circuitry of this transceiver, in the interest of technological improvement, without notification of the owners.

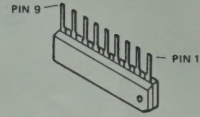
MOTHER BOARD



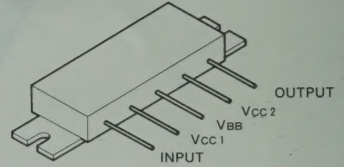
(obverse view of "component" side)



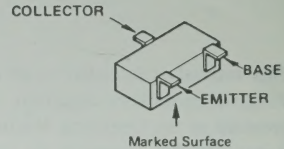
(reverse view of "chip-only" side)



LA4145 (Q103)



M57797MA (Q109)

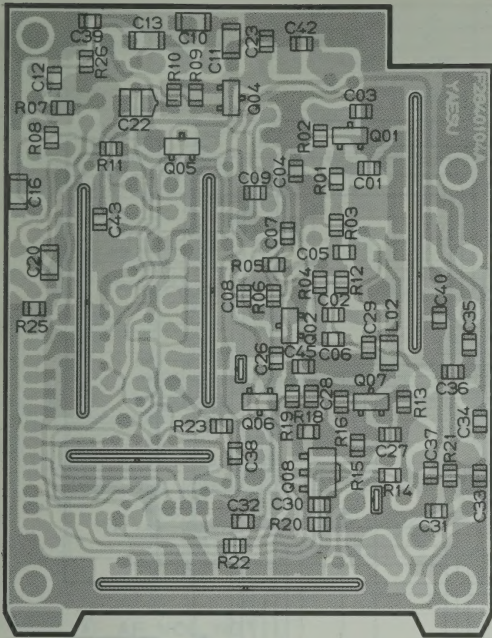


- 2SA1162GR (SG) : (Q104)
- 2SC2712GR (LG) : (Q105)
- 2SC3356 (R22) : (Q101,102)
- 2SC3585 (R42) : (Q107)
- FA1A4M (L33) : (Q106)

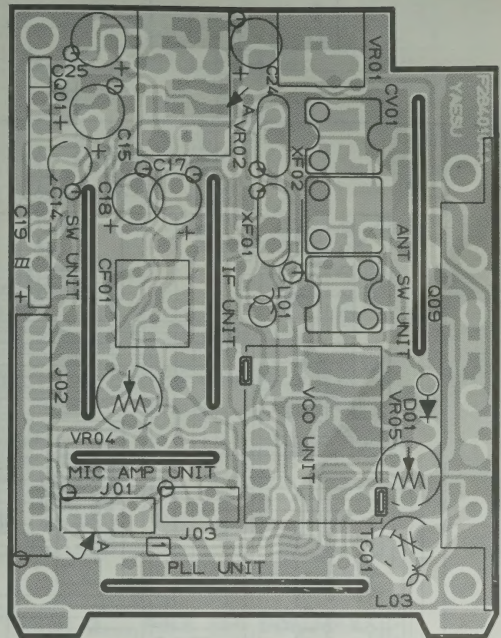


2SC2954 (Q108)

MOTHER BOARD



(obverse view of "chip-only" side)



(reverse view of "component" side)

CHIP SEMICONDUCTOR CROSS-REFERENCE

PART LOCATION NO.	ORIGINAL	REPLACEMENT		
	NOMENCLATURE (MARKING) AND PART NUMBER	NOMENCLATURE (MARKING) AND PART NUMBER		
Q104,605,606,607,1002,1012	2SA1162GR(SG) G3111620G	2SA812F/G(M6/M7) G3108120F/G	2SA1052C/D(MC/MD) G3110520 C/D	2SA1179F/G(M6/M7) G3111790 F/G
Q103,602,603,608,801,802,902, 903,905,906,1003,1004,1005, 1006,1010	2SC2712GR/BL(LG/L/L) G3327120G/B	2SC1623F/G(L6/L7) G3316230F/G	2SC2462C/D(LC/LD) G3324620 D/D	2SC2812 F/G(L6/L7) G3328120 F/G
Q701	M5224FP G1090726	LA6324M G1090559		
D1001,1002	1SS181(A3) G2070001	MC2836(A4) G2070024	DCA015TA(A4) G2070014	
D603,1007,1008	1SS184(B3) G2070009	MC2838(A6) G2070018	DCB015TA(A6) G20700021	

* Semiconductors not listed above may be replaced only with original types.

MOTHER BOARD VOLTAGE CHART

(DC VOLTS)

	1	2	3	4	5	6	7	8	9	REMARKS
Q ₁₀₃	0.7	0	0.6	0.6	0	4.0	7.8	7.7	7.7	RX
Q ₁₀₉	0/1.6	11.5	0/4.7	0/10.0	0					RX/TX

	E	O	B	REMARKS
Q ₁₀₀₁	0	3.8	0.7	RX
Q ₁₀₀₂	0	4.5	0.7	RX
Q ₁₀₀₄	4.1/0 SAVE ON	0/1.1 SQ VR MAX	4.7/0 SAVE ON	RX/TX
Q ₁₀₀₅	0	4.2/0 SOL ON	0	RX
Q ₁₀₀₆	0	0/2.6	4.7/0	RX/TX
Q ₁₀₀₇	0	0/4.6	0/0.7	RX/TX
Q ₁₀₀₈	0/0.3	0/10	0/0.9	RX/TX

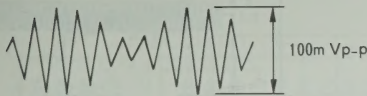
	1	2	3	4	5	REMARKS
J ₁₀₁	CLOCK	DATA	PLL STB	SP	SOL	
	0	0	0	0	0/1.1 SQ VR MAX	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	REMARKS
J ₁₀₂	GND	+B	LOW	D/A	A/D	TONE OUT	MIC OUT								
	0	11.5	0/3.9/0	—	—	0	2.0								
	SCAN	TONE STB	TONE C	PTT	TX	SAVE	CPU 5V								
	4.2/0/0(SOL ON)	0	0	4.5/0	4.4/0.1	0(4.3.SAVE ON)	5.0								

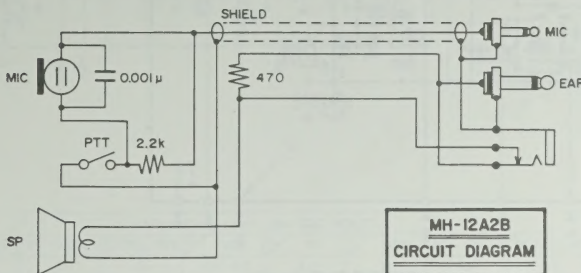
	1	2	3	4	REMARKS
J ₁₀₃	TONE	MIC MUTE	5V	GND	
	0	0.5	4.8	0	

	1	2	3	4	5	REMARKS
P ₁₀₁	TONE	CPU 5V	TONE STB	DATA	CLOCK	
	0	5.0/0	0	0	0	
	DET IN	TONE C	AF OUT	TX 5V	GND	
	1.7/0	0	0	0	0	

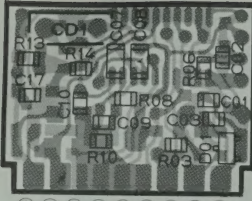
(a) AF VOL HOT



(b) Q₁₀₃ PIN 8 (AF VOL MAX)

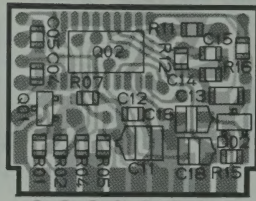


IF UNIT



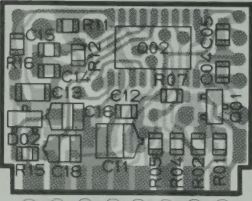
1 2 3 4 5 6 7 8 9

(obverse view of
"mixed-component" side)



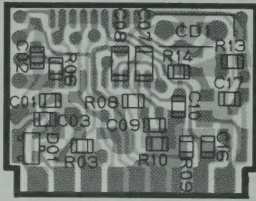
8 7 6 5 4 3 2 1

(obverse view of
"chip-only" side)



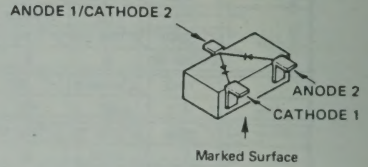
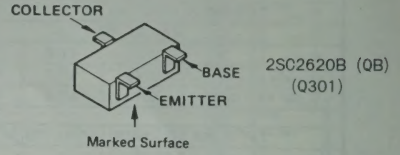
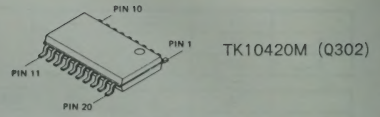
1 2 3 4 5 6 7 8

(reverse view of
"chip-only" side)

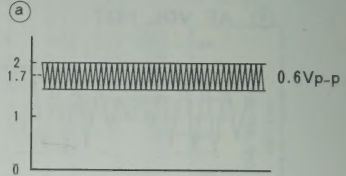
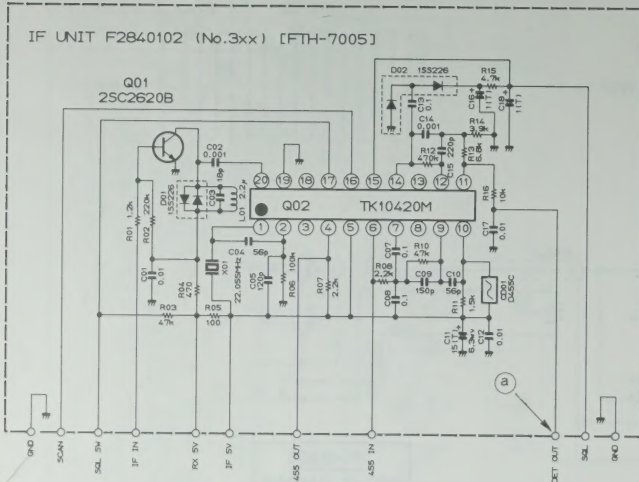


9 8 7 6 5 4 3 2 1

(reverse view of
"mixed-component" side)



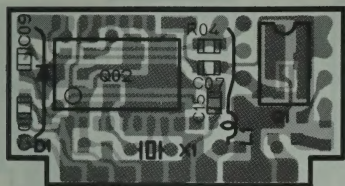
1SS226 (C3)
(D301,302)



RESISTOR VALUES ARE IN Ω , 1/10W;
CAPACITOR VALUES ARE IN μ F, 50V;
INDUCTOR VALUES ARE IN HENRIES, UNLESS OTHERWISE NOTED.
(T) CAPACITORS ARE TANTALUM, 10V.

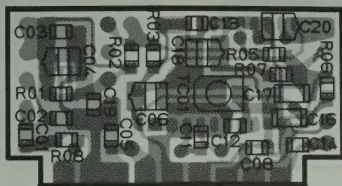
Mixed-Component side (DC VOLT)										REMARKS
DET OUT	SIG OUT	455 IN	GND	IF 5V	455 OUT	SCAN	SQL SW	GND		
1.7	0.7	1.1	0	4.4	4.3	4.3/0 SQLON	0/3.4 SQLON	0		RX/TX
Chip-Only side (DC VOLT)										REMARKS
GND	SQL	GND	GND	GND	RX 5V	IF IN	GND			
0	MAX 0. MAX 1.15 0.115 SQL	0	0	0	4.75	0.8	0			RX

PLL UNIT



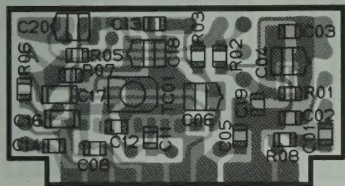
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

(obverse view of
"mixed-component" side)



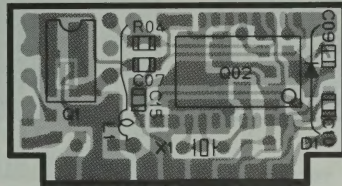
⑨ ⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

(obverse view of
"chip-only" side)



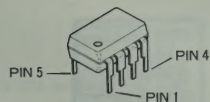
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

(reverse view of
"chip-only" side)

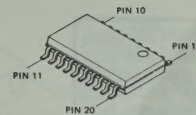


⑨ ⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

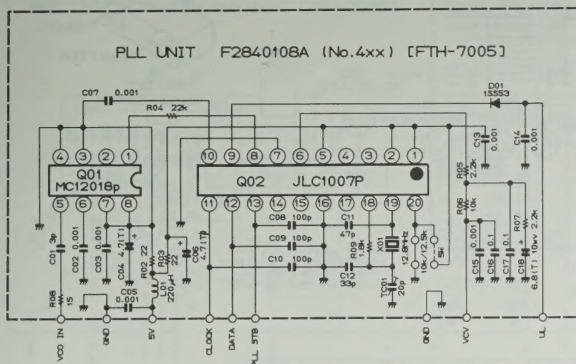
(reverse view of
"mixed-component" side)



MC12018P(Q401)



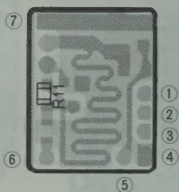
JLC1007P (Q402)



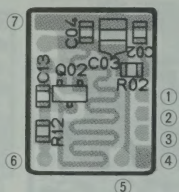
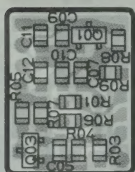
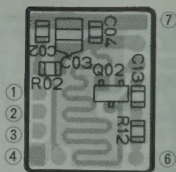
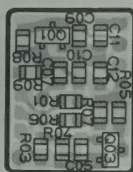
RESISTOR VALUES ARE IN Ω , 1/10w;
CAPACITOR VALUES ARE IN μ F, 50wv;
UNLESS OTHERWISE NOTED.
(T) CAPACITORS ARE TANTALUM, 8.3wv.

[illegible]

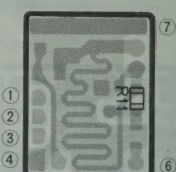
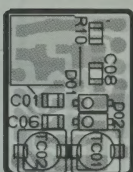
VCO UNIT



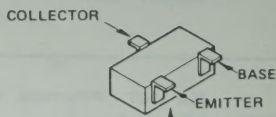
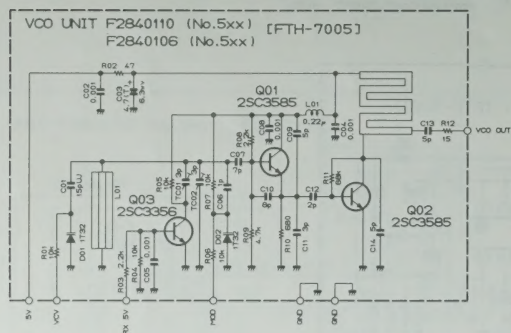
(obverse view of
"chip-only" side)



(reverse view of
"chip-only" side)



(reverse view of
"mixed-component" side)



Marked Surface

2SC3356 (Q503)

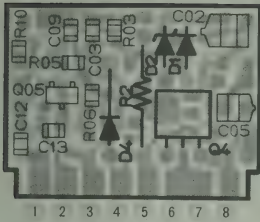
2SC3585 (D/E)

(Q501, 502)

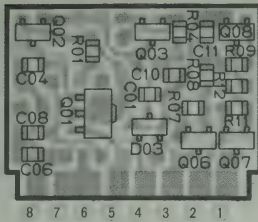
RESISTOR VALUES ARE IN Ω , 1/10W:
CAPACITOR VALUES ARE IN μ F, 50V:
UNLESS OTHERWISE NOTED.
(†) CAPACITORS ARE TANTALUM, 18V.

1	VCV	2	MIC IN	3	RX5	4	GND	5	5V	6	OUT	7	GND	REMARKS
	1.0~3.0		0/2.6		4.7/0		0		4.8		0.1/0		0	RX/TX

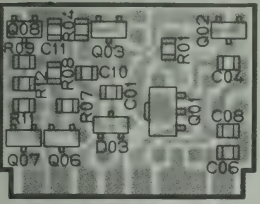
REG UNIT



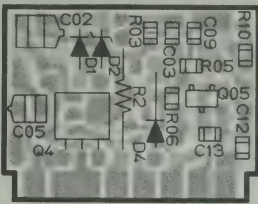
(obverse view of "mixed-component" side)



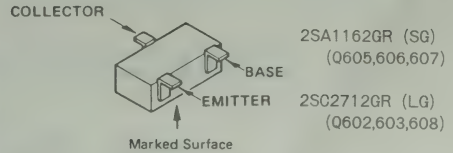
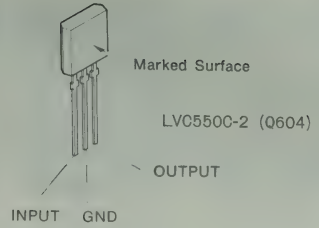
(obverse view of "chip-only" side)



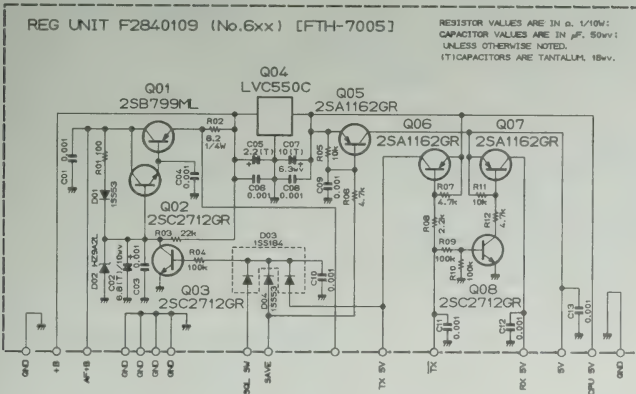
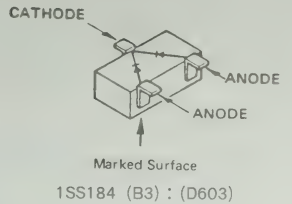
(reverse view of "chip-only" side)



(reverse view of "mixed-component" side)

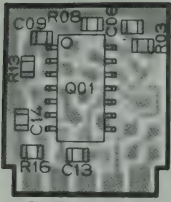


2SB799 (Q601)

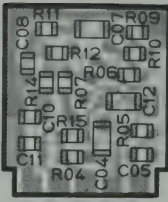


Mixed-Component side (DC VOLT)								
1	2	3	4	5	6	7	8	REMARKS
GND	GND	TX	SAVE	CPU 5V	GND	AF +B		
0	0	4.3/0.1	0.43 SAVE ON	5.0	0	0	7.8	RX/TX
Chip-Only side (DC VOLT)								
1	2	3	4	5	6	7	8	REMARKS
RX 5V	5V	TX 5V	SOL SW	N/C	GND	+B		
4.7/0.1	4.8/4.9	0/4.9	0/1.4 SOL ON	—	0	0	11.6	RX/TX

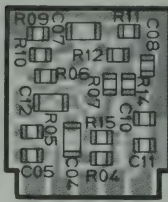
MIC AMP UNIT



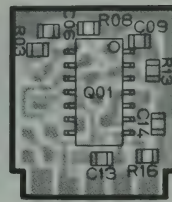
① ② ③ ④ ⑤
(obverse view of
"IC" side)



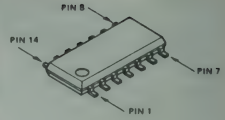
① ② ③ ④ ⑤
(reverse view of
"C-R" side)



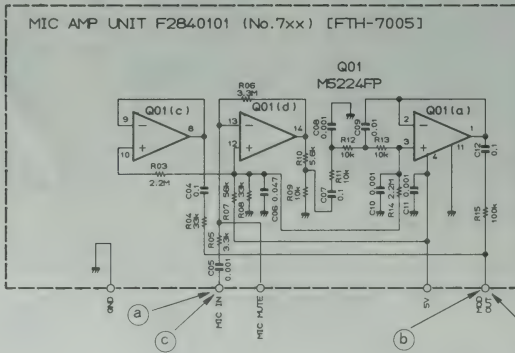
⑤ ④ ③ ② ①
(obverse view of
"C-R" side)



⑤ ④ ③ ② ①
(reverse view of
"IC" side)



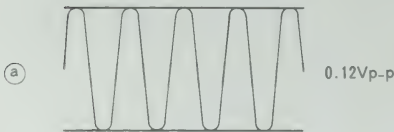
M5224FP (Q701)



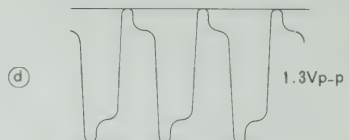
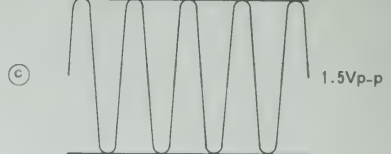
IC side (DC VOLT)					
SIG IN	D A	A/D	tone IN	GND	REMARKS
0	—	—	0	0	

C-R side (DC VOLT)					
GND	5V	MOD OUT	MIC MUTE	MIC IN	REMARKS
0	4.8-4.9	0.24	0.5	2.0	RX, TX

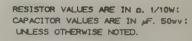
MIC INPUT 1kHz 2m Vrms



MIC INPUT 1kHz 25mVrms




(5) (4) 3 2 (1)
(reverse view of
"IC" side)



(a) 0.12V_{p-p}

(a)

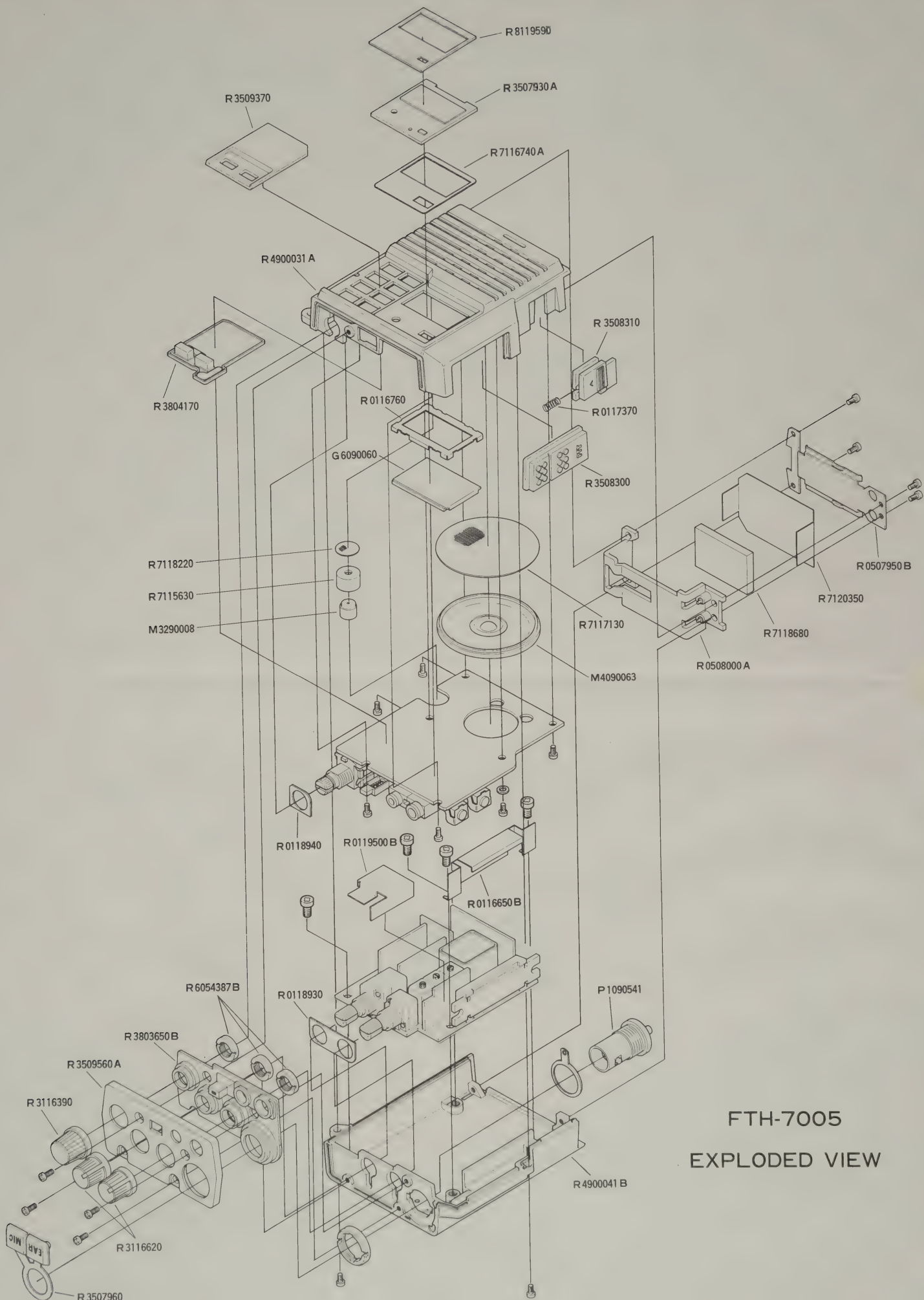
(c)  1.5Vp-p

©

Figure 1b shows the output voltage of the first stage of the PLL. The waveform is a periodic, non-sinusoidal signal oscillating between two horizontal levels. The peak-to-peak voltage is labeled as 0.08Vp-p.

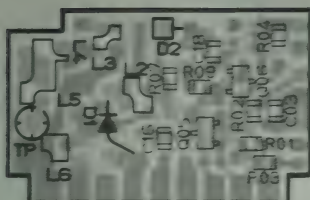
b

(d)



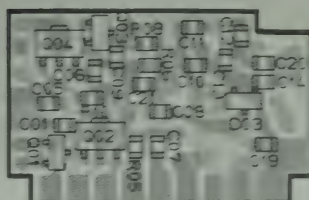
FTH-7005
EXPLODED VIEW

ANT SW UNIT



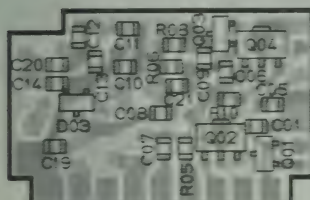
1 2 3 4 5 6 7 8 9

(reverse view of
"mixed-component" side)



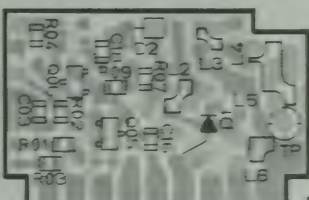
9 8 7 6 5 4 3 2 1

(reverse view of
"chip-only" side)



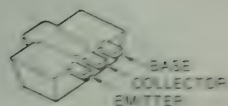
1 2 3 4 5 6 7 8 9

(reverse view of
"chip-only" side)

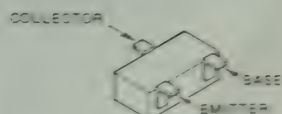


9 8 7 6 5 4 3 2 1

(reverse view of
"mixed-component" side)

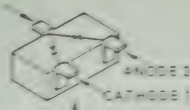


25B799 0902.904



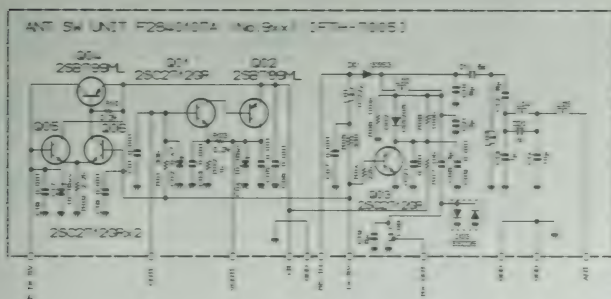
Marked Surface
25C21120P L6
0901.903.903.906

ANODE 1/CATHODE 2



Marked Surface

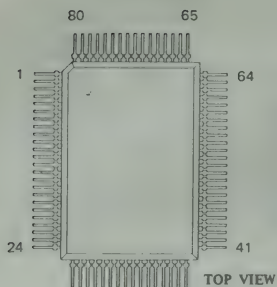
155006 06 0906



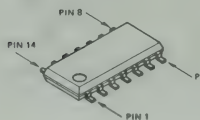
RESISTOR VALUES ARE IN OHMS
CAPACITOR VALUES ARE IN P.F. UNLESS
INDICATED OTHERWISE

Mixed-Component side DC VOLT									
SW	Rx ANT	SW	RF SW	Rx SW	SW	SW	SW	SW	RF SW
0	-	0	0.48	0	0	0.48	0.48	0.48	0.48
Chip-Only side DC VOLT									
SW	Rx ANT	SW	RF SW	Rx SW	SW	SW	SW	SW	RF SW
0	0	0	-	0.48	-	-	-	-	Rx TX

CNTL UNIT

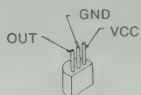


HD613901A51 (Q1001)

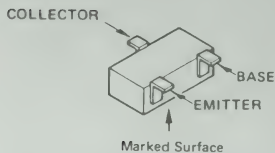


μPD4066BG (Q1008)

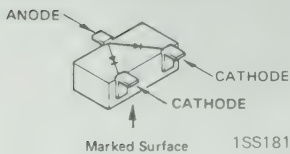
μPD4001BG (Q1009)



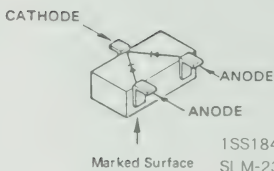
PST523G (Q1007)



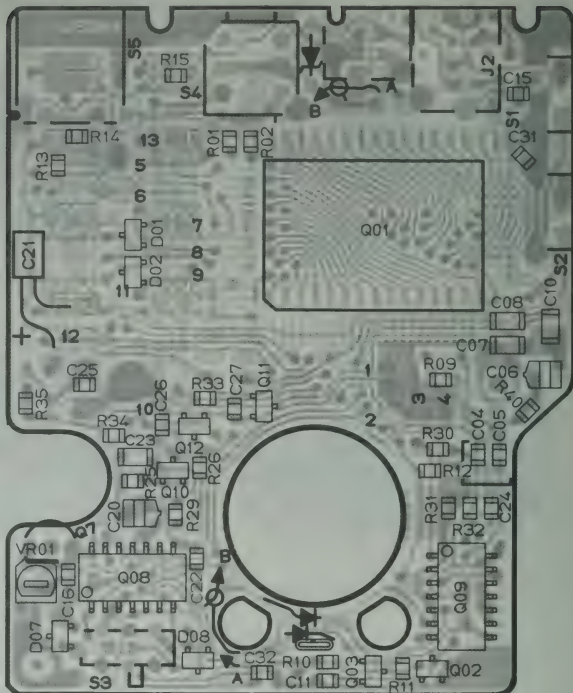
2SA1162GR (SG) : (Q1002,1012)
2SC2712GR (LG) : (Q1003,1004)
1005,1006
1010
FA1A4M (L33) : (Q1011,1013)



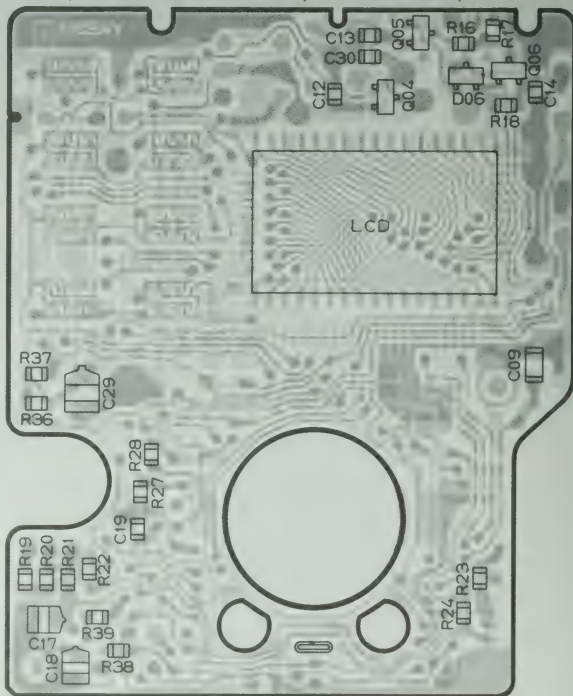
1SS181 (A3) :
(D1001,1002,1008)



1SS184 (B3) : (D1007)
SLM-23VMW (D1006)
(LED)

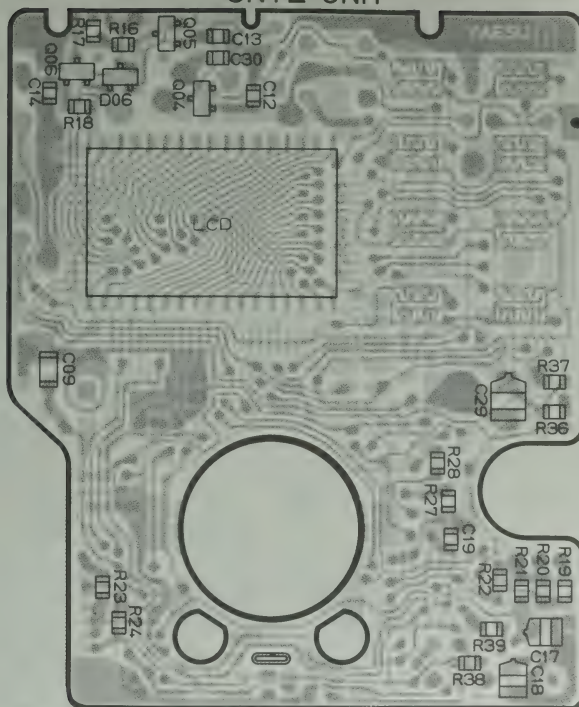


(obverse view of "microprocessor" side)

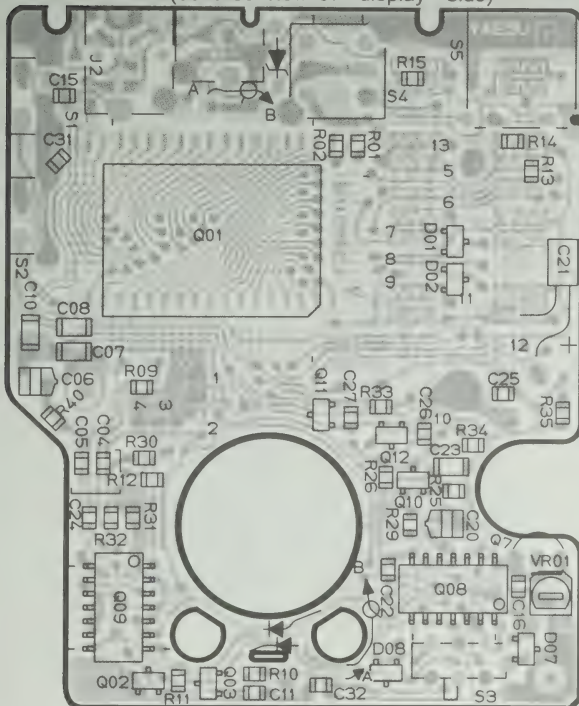


(reverse view of "display" side)

CNTL UNIT

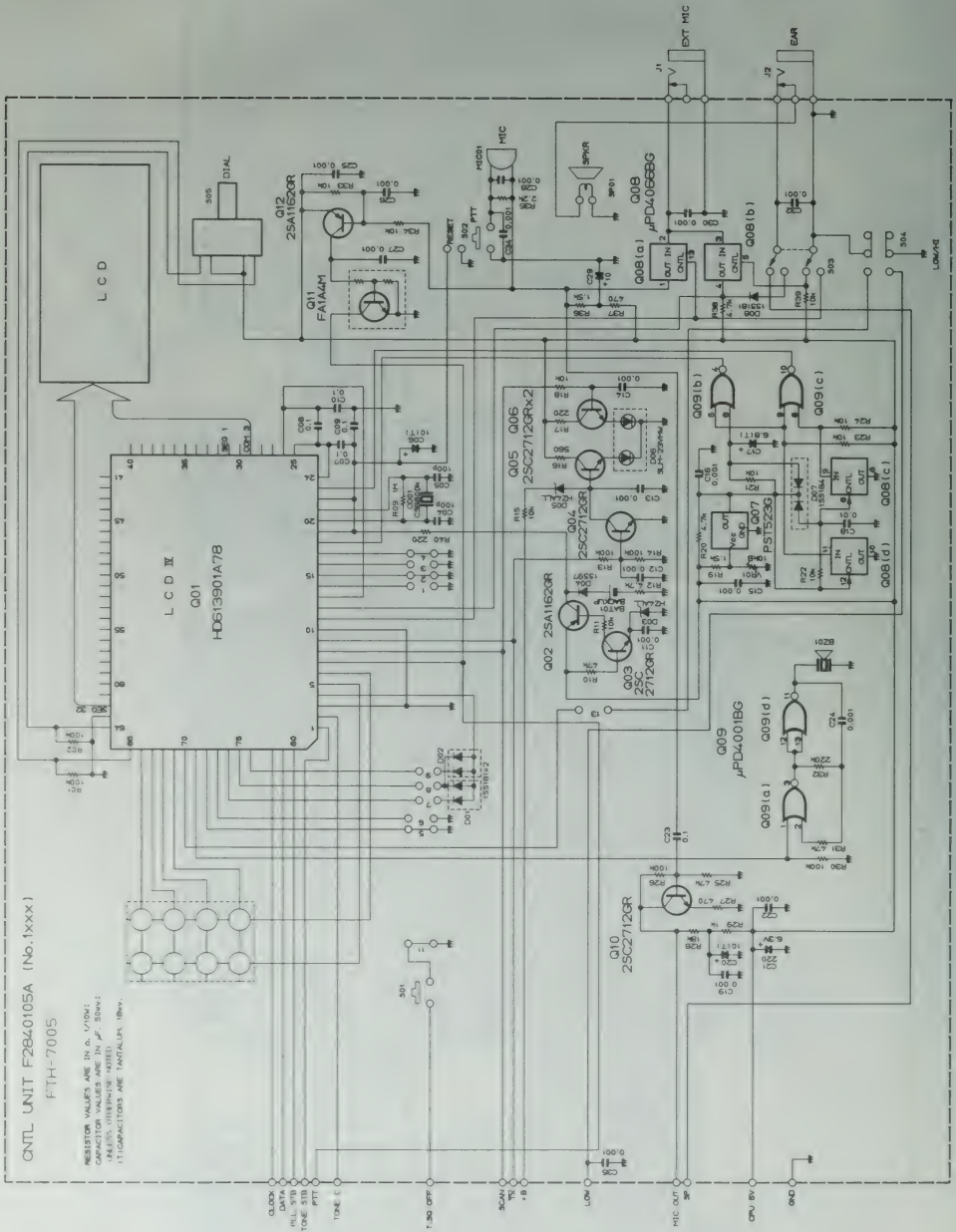


(obverse view of "display" side)

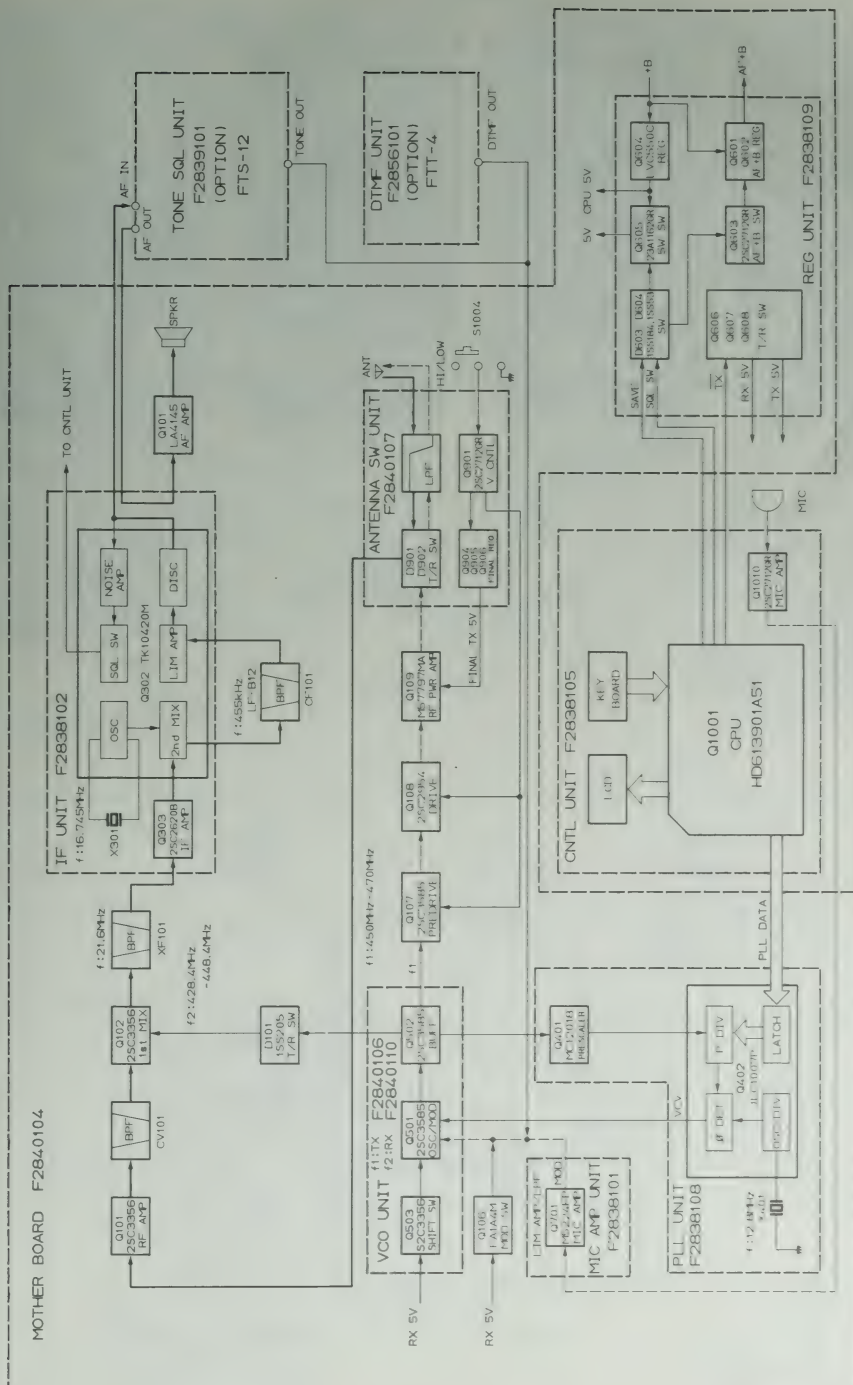


(reverse view of "microprocessor" side)

CNTL UNIT



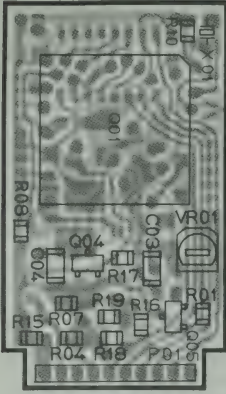
MOTHER BOARD F284.0104



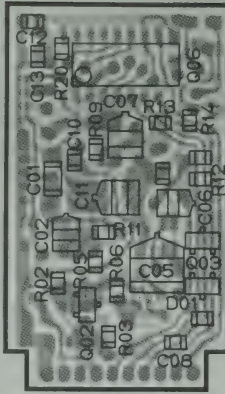
FTH-700S BLOCK DIAGRAM

— RECEIVED
--- TRANSMIT
... COMMON/CNTL

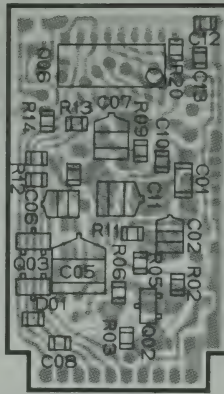
FTS-12



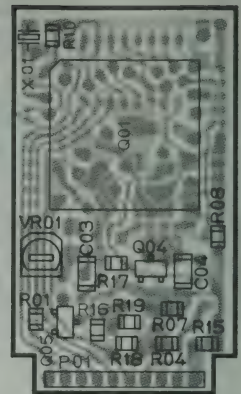
(obverse view of "mixed-component" side)



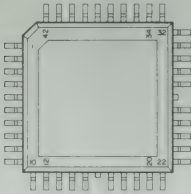
(reverse view of "chip-only" side)



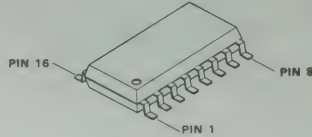
(obverse view of "chip-only" side)



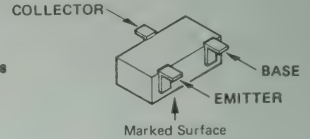
(reverse view of "mixed-component" side)



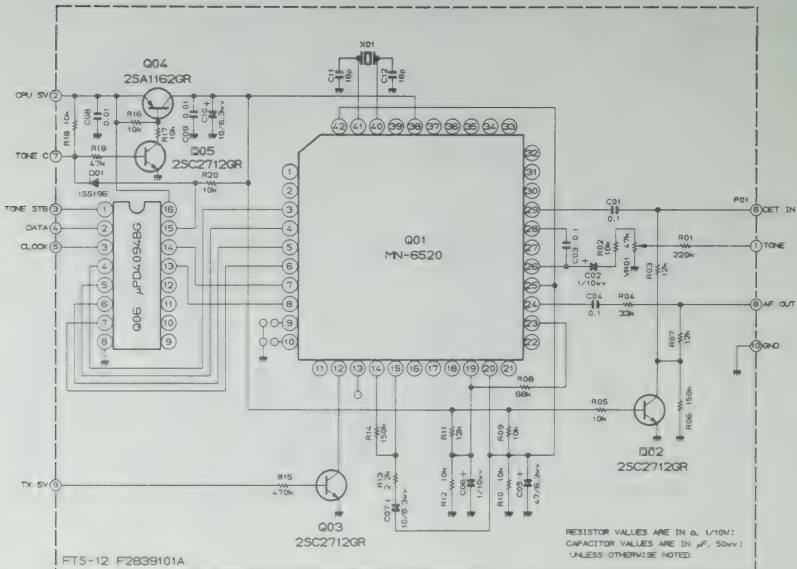
MN6520 (Q01)



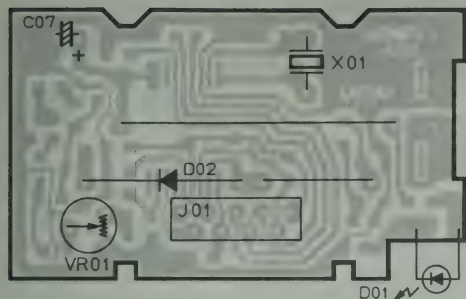
μPD4094BG (Q06)



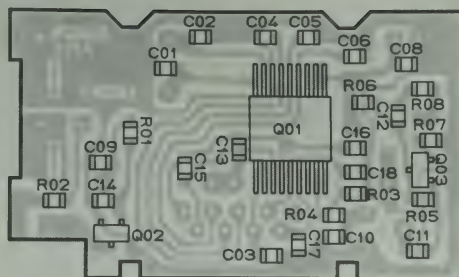
2SA1162GR (SG) : (Q04)
2SC2712GR (LG) : (Q02, Q03, Q05)



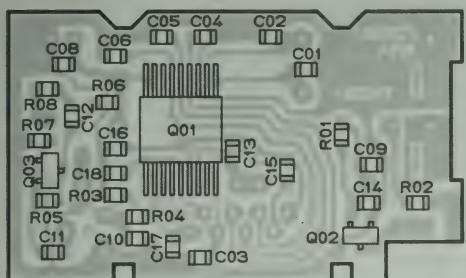
FTT-4



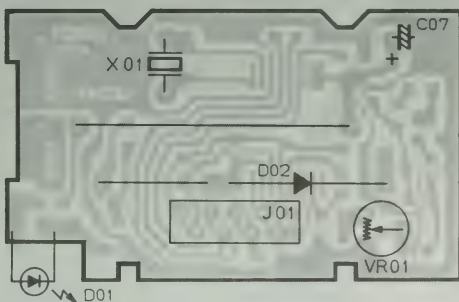
(obverse view of "mixed-component" side)



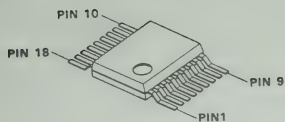
(obverse view of "chip-only" side)



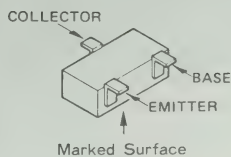
(reverse view of "chip-only" side)



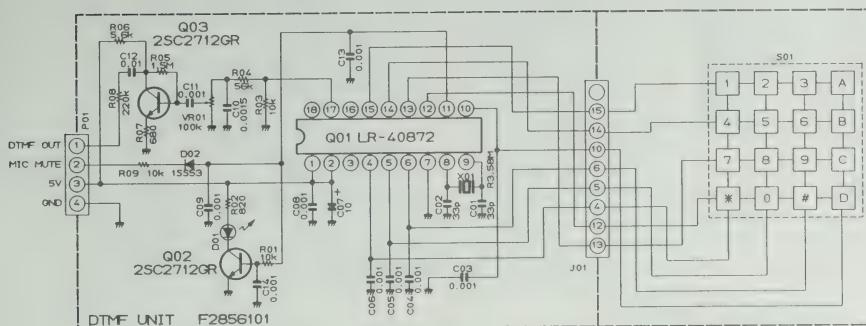
(reverse view of "mixed-component" side)



LR40872(Q01)

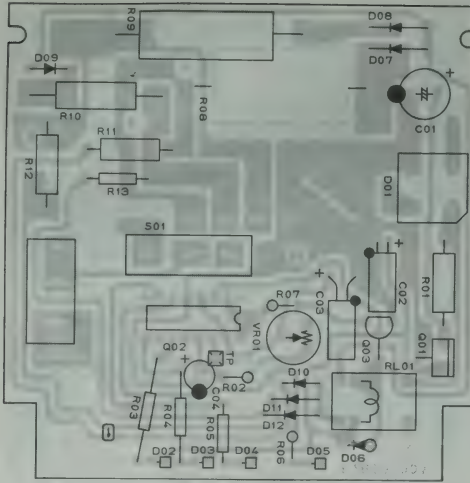


2SC2712GR(LG)
(Q02,Q03)

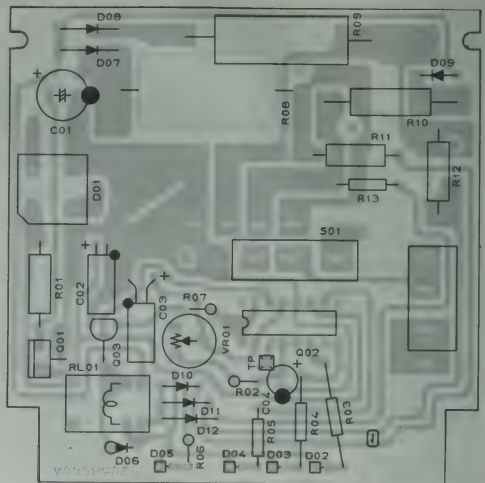


RESISTOR VALUES ARE IN Ω , 1/10W;
CAPACITOR VALUES ARE IN μ , 50WV;
UNLESS OTHERWISE NOTED

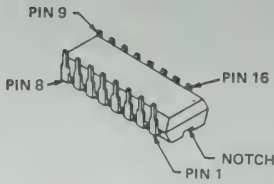
NC-29



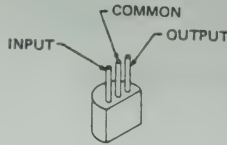
(obverse view of
"component" side.)



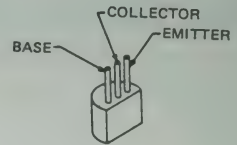
(reverse view of
"component" side)



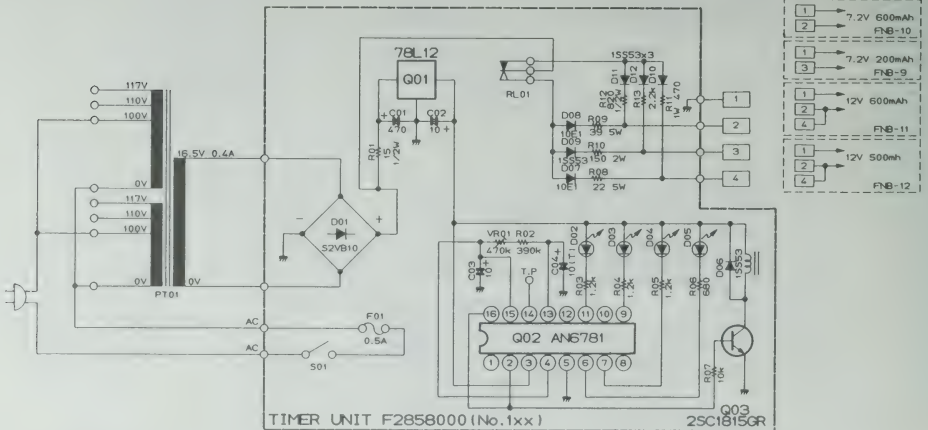
AN6781(Q102)



μPC78L12(Q101)



2SC1815GR(Q103)



RESISTOR VALUES ARE IN Ω, 1/4W;
CAPACITOR VALUES ARE IN μF, 50V;
UNLESS OTHERWISE NOTED.
T1: CAPACITORS ARE TANTALUM, 16V.

NC-29
CIRCUIT DIAGRAM

CIRCUIT DESCRIPTION

Refer to the block diagram on the facing page while reading this description. For finer details, refer to the schematic diagrams.

Receiver

Incoming signals at the antenna are passed through a lowpass filter and t/r switching diode on the Ant Sw Unit before delivery to the Mother Board. Here, RF amplifier Q101 (2SC3356) boosts the signal prior to filtering by a 3-stage varactor-tuned resonator, and application to first mixer Q102 (2SC3356) along with the first local signal from the VCO (described later).

The 21.6 MHz product from the first mixer is delivered through 4-pole monolithic crystal filter XF101 (± 7.5 kHz BW) on the Mother Board to first IF amplifier Q301 (2SC2620B) on the IF Unit.

FM receiver sub-system IC Q302 (TK10420M) on the IF Unit includes local oscillator, mixer, IF limiter amplifier and FM detector circuits. The amplified first IF signal is applied to the mixer section, along with the second local signal internally generated via 22.055 MHz crystal X301. The 455 kHz product is then passed back to ceramic filter CF101 (± 6 kHz BW) on the Mother Board, and returned to Q302 for second IF amplification and limiting to remove amplitude variations before application to the discriminator.

The resulting audio output from Q302 is delivered from the IF Unit to the Tone Unit connector. If no tone unit is installed, it is de-emphasized by R124 (at the connector) and C110 and C111 near audio amplifier Q103 (LA4145) before passing through VOL potentiometer VR102 to the amplifier and speaker or earphone. If a Tone Unit is installed, resistance for the de-emphasis network is provided on that unit.

When no signal is being received, high frequency noise is present at the output of the discriminator stage of Q302 on the IF Unit. This noise is sampled and high-pass filtered by R313 and C315, and then amplified by a noise amplifier in Q302, the output of which is rectified by D302 to provide DC for squelch switching. This squelch control DC (the level of which is adjustable by the operator via Squelch control VR101) is amplified within Q302, providing a squelch gate control signal output at pin 17, which is passed to squelch gate Q603 (2SC2712GR) on the Regulator Unit. Q603, along with Q601 (2SB799ML) and Q602 (2SC2712GR), turns off the supply voltage to AF amplifier Q103, disabling it when no signal is received. A sample of the squelch gate control signal also causes ON AIR/BUSY indicator LED D1006 (via Q1006, 2SC2712GR, on the Control Unit) to glow green when the squelch is open.

Transmitter

When the push-to-talk switch is pressed, audio from the microphone is amplified first by Q1010 (2SC2712GR) before delivery to the Mic Amp Unit. There, after pre-emphasis by C705 and R705, microphone audio processing opamp IC Q701 (M5224FP) provides IDC (instantaneous deviation control) to prevent overdeviation from excessive microphone levels, and also lowpass filtering to suppress out-of-band modulation.

Processed audio from the Mic Amp Unit is applied to varactor diode D502 (1T32) to modulate VCO Q501 (2SC3585) on the VCO Unit, which oscillates at the transmit frequency. A sample of the VCO oscillating frequency is buffered by Y502 (2SC3585), and amplified by Q107 (2SC3585) and driver Q108 (2SC2954) on the Mother Board before final amplification up to 5 watts by RF power module Q109 (M57797H).

The transmit signal is passed through t/r switching diode D901 on the Ant Sw Unit, and then lowpass filtered by L904, L905 and C913, C914 and C01) to suppress harmonics before application to the antenna.

Transmitter output is controlled by Q904 (2SB799ML), Q905 and Q906 (2SC2712GR x 2) on the Ant Sw Unit. When the TX 5V line (from the Regulator Unit) is active, bias voltage is applied to the RF power module, turning it on. High/Low power push button switch S1004 on the Control Unit controls Q901 (2SC2712GR) and Q902 (2SB799ML), which control the gain of RF driver Q108 on the Mother Board, reducing drive to the RF module when low power is selected. This circuit is also used by the PLL to disable the transmitter when the PLL is unlocked.

PLL

The first local signal for the receiver (428.4-448.4 MHz) and the carrier for the transmitter (at the transmit frequency) are generated by the PLL. This circuit consists of a voltage-controlled oscillator (VCO), prescaler, programmable divider, reference oscillator, phase detector, charge pump and lowpass filter.

The VCO (on the VCO Unit) consists of Q501 and varactor diode D502 (mentioned above). The oscillating frequency is controlled primarily by the level of DC voltage fed from the loop filter (lowpass filter) to the varactor diode. The VCO output is buffered by Q502 (2SC3585), and then delivered to prescaler Q401 (MC12018) on the PLL Unit, which divides the VCO frequency by 128 or 129 according to a control signal from the prescaler control logic section of PLL subsystem IC Q402 (JLC1007P).

The divided signal from the prescaler is fed to the programmable divider section of Q402, where it is further divided down to 12.5 kHz according to data from microprocessor Q1001 on the Control Unit. Meanwhile, the reference oscillator section of Q402 generates a 12.8 MHz frequency reference with crystal X401, which signal is divided by 1024 to also produce 12.5 kHz.

The 12.5 kHz reference and the divided VCO signal are applied together to the phase detector section of Q402, from which any phase difference between the two signals results in a pulse train from the phase detector. The pulses are applied to the charge pump section of Q402 and then through a lowpass filter (R405-407 and C415-418), to produce a DC

voltage at a level corresponding to the difference in phase between the reference and the divided VCO signal. This DC voltage is returned to the varactor diodes on the VCO Unit, locking the frequency of the VCO to the crystal reference oscillator.

Control Unit & Supply Buses

Microprocessor Q1001 (HD613901A78) on the Control Unit contains programming in masked ROM to generate serial data to control the programmable divider in the PLL according to channel frequency data stored in externally programmable static RAM (backed up by lithium battery BAT1001 when power is switched off). Q1001 also includes programming and driver logic for the Liquid Crystal Display, and for channel frequency scanning. Jumpers are installed during manufacture to select channel steps and frequency range.

The microprocessor receives an indication of the condition of the noise squelch from the FM receiver subsystem IC on the IF Unit, by which scanning is activated or deactivated.

Q1001 also controls the power saver function and transmit/receive switching by selecting the supply buses on the Regulator Unit: Q606, Q607 (2SA1162GR x 2) and Q608 (2SC2712GR) select the TX or RX 5V bus from voltage regulator Q604 (LVC550C), and Q605 (2SA1162GR) disables the RX 5V bus when the power saver is active. Also on the Regulator Unit, the power saver disables the receiver audio amplifier as described previously for the squelch gate.

When the push-to-talk switch is pressed, the impedance change on the microphone line is detected by Q1012 (2SA1162GR), and transformed into low impedance switching by Q1011 (FA1A4M) for the microprocessor and control of other circuits. The microprocessor activates Q1004 and Q1005 (2SC2712GR x 2) which causes LED indicator D1006 to glow red (ON AIR).

Voltage comparator Q1007 (PST523G), analog switch Q1008 (uPD4066BG) and NAND gate Q1009 (uPD4001BG) control power-up resetting of the microprocessor, external/internal microphone and speaker/earphone selection, and provide and oscillator for the beeper.

ALIGNMENT

The FTH-7005 has been aligned at the factory for the specified performance across the frequency range specified. Realignment should therefore not be necessary except in the event of a component failure. All component replacement and service should be performed only by an authorized Yaesu representative, or the warranty policy may be voided.

The following test equipment is required for alignment:

Yaesu FYG-3U Channel Programmer for FTH-7005

RF Signal Generator:
calibrated output level at 500 MHz

Deviation Meter (linear detector)

Oscilloscope

AF Millivoltmeter

SINAD Meter

Inline Wattmeter: 500 MHz

Regulated DC Power Supply:
adjustable from 4 to 17V, 2A

50-ohm Non-reactive Dummy Load: 10W at 450 MHz

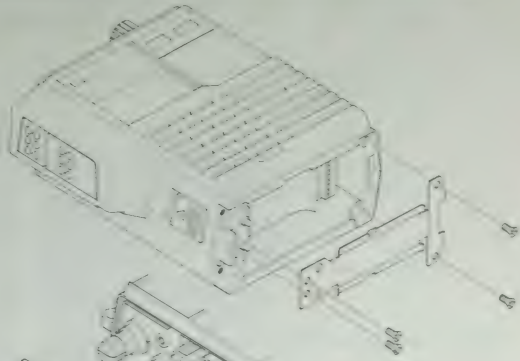
Frequency Counter: 0.2ppm accuracy at 450 MHz

AF Signal Generator

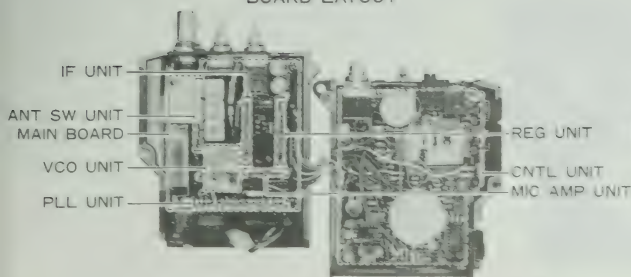
DC Voltmeter: high impedance

CASE DISASSEMBLY

1. Make sure the transceiver is off. Remove the hard or soft case, if used, and remove the battery pack.
2. Remove the four screws affixing the battery spring plate on the bottom of the transceiver, and carefully remove the plate.
3. Remove the four screws affixing the top panel, and carefully remove the panel.
4. Remove the two screws affixing the front and rear halves of the case, and gently separate the halves, using care not to stress the interconnecting wires.



BOARD LAYOUT



Before beginning alignment, make note of all channel frequencies set in the transceiver. Use the FYG-3U keypad to set the transceiver to frequencies called for during alignment.

I. PLL & TRANSMITTER

Set up the test equipment as shown below for transmitter alignment. Adjust the supply voltage to 12.0V for all steps except Transmitter Output Power alignment (B).

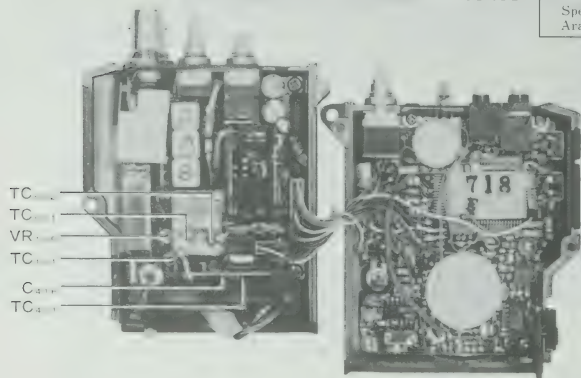
A. PLL VCV (Varactor Control Voltage)

- (1) Connect the DC voltmeter between C416 on the PLL Unit and chassis ground.
- (2) Set the transceiver to 450 MHz. Key the transmitter and adjust trimmer TC502 on the VCO Unit for $1.0 \pm 0.1V$ on the voltmeter.
- (3) While receiving at 450 MHz, adjust trimmer TC501 on the VCO Unit for $1.0 \pm 0.1 VDC$.
- (4) Repeat steps (2) and (3) several times, if necessary, and then retune the transceiver (via the FYG-3U) to 470 MHz and confirm the VCV is now 3 to 4V on both receive and transmit.

B. Transmitter Output Power

- (1) Tune the transceiver to 460 MHz and set the LOW switch to the undepressed position.
- (2) Increase the supply voltage to 12.5V.

PLL & TRANSMITTER ALIGNMENT POINTS



- (3) Adjust TC101 on the Mother Board for peak output power on the wattmeter (at least 5W with less than 1.6A supply current).
- (4) Press the LOW switch on the top panel, and adjust VR105 on the Mother Board for 0.5 watts output.
- (5) Set the LOW switch back to the high power position (undepressed), and confirm at least 5W transmitter output when the transceiver is set 5 MHz above and below the center frequency.

- (6) Return the supply voltage to 12.0V.

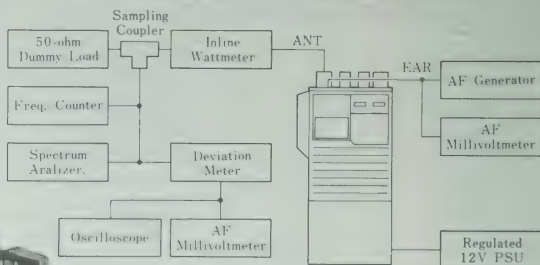
C. PLL Reference Frequency

With the transceiver tuned to band center, adjust TC401 on the PLL Unit, if necessary, so the display frequency matches the frequency counter when transmitting.

D. Modulation Level

- (1) With the transceiver tuned to band center, adjust the AF generator for 25mV output at 1 kHz to the MIC jack.
- (2) Adjust VR104 on the Mother Board for ± 4.5 kHz deviation on the deviation meter.

PLL & TRANSMITTER ALIGNMENT SETUP

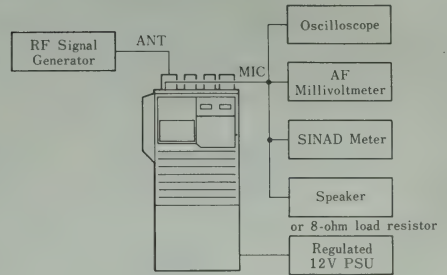


II. RECEIVER

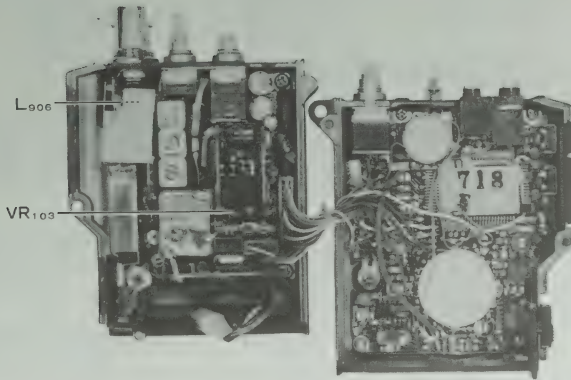
Set up the test equipment as shown below for receiver alignment.

- (1) With the transceiver and RF signal generator both tuned to 460 MHz, set the generator for ± 3.5 kHz deviation of 1 kHz tone modulation.
- (2) While observing the SINAD meter, adjust the signal generator level for 12dB SINAD. If the level is above 0.2uV, carefully expand or compress the windings of L906 as required for best SINAD.

RECEIVER ALIGNMENT SETUP



RECEIVER ALIGNMENT POINTS



FTH-7005 PARTS LIST

MAIN CHASSIS					CRYSTAL FILTER
Symbol No.	Part No.	Name & Description	XF101	H1102102	21P15BU 21.6MHz
C1	K00173060	CAPACITOR			
		Ceramic disc 50WV 6pF SL (DD104SL060D50)		R7066320	Insulator
C2,3	K10176102	" " " 0.001μF B (DD104B102K50)			CERAMIC FILTER
			CF101	H3900280	LF-B12
					RESISTORS
J01	P1090541	CONNECTOR	R122,126	J24205000	RMC 1/10T000J 1/10W 0Ω
		BNC-RM	R120	J24205479	" " 479J " 4.7Ω
			R114,121	J24205150	" " 150J " 15Ω
			R108	J24205220	" " 220J " 22Ω
			R105,113	J24205101	" " 101J " 100Ω
			R103	J24205221	" " 221J " 220Ω
		MISCELLANEOUS	R118	J24205271	" " 271J " 270Ω
	R3116390	DIAL Knob	R127	J01215681	RD18TJ681 1/8W 680Ω
	R3116620	VOL, SQL Knobs	R123	J24205102	RMC 1/10T102J 1/10W 1kΩ
	R3508300	PTT Button Cover	R119	J24205122	" " 122J " 1.2kΩ
	R3508310	UNLOCK Lever	R102	J24205152	" " 152J " 1.5kΩ
	R0117370	Coil Spring	R106	J24205182	" " 182J " 1.8kΩ
	R0507950B	Battery Spring Plate	R112	J24205562	" " 562J " 5.6kΩ
	R3503650A	Top Panel Gasket	R116	J24205223	" " 223J " 22kΩ
	R3507960	Jack Seal Gasket	R124	J00215223	RD18VJ223 22kΩ
			R107,115	J24205333	RMC1/10T333J1/10W 33kΩ
			R101	J24205683	" " 683J " 68kΩ
			R109-111,125	J24205104	" " 104J " 100kΩ
			R104	J24205394	" " 394J " 390kΩ
MOTHER BOARD UNIT					
Symbol No.	Part No.	Name & Description			POTENTIOMETERS
	F2840104A	Printed Circuit Board	VR101	J60800128	K091K0004-20KB 20kΩ B
	C028404AL	PCB with Components	VR102	J60800129	K0911100D-20KA 20kΩ A
			VR104,105	J51776473	RH0411CS4J 47K 47kΩ
					CAPACITORS
			C106	K22170201	ChipCeramic50WV0.5pF CH (C2012CH1H0R5CFA)
Q103	G1090558	LA4145	C103	K22170204	" " " 3pF "
					(C2012CH1H030CFA)
			C109	K22170208	" " " 7pF "
					(C2012CH1H070DFA)
Q109	G1090766	POWER MODULE M57797H	C101,128	K22170209	" " " 8pF "
					(C2012CH1H080DFA)
			C149	K22170211	" " " 10pF "
					(C2012CH1H100DFA)
			C108	K22170219	" " " 22pF "
					(C2012CH1H220JFA)
Q101,102	G3333567 D/E	2SC3356-T2B R24/R25	C127	K22170215	" " " 15pF "
					(C2012CH1H150JFA)
Q104	G3111627G	2SA1162GR-TE85R	C102,104,105,112 123,126,129-131 133-137,139,140 142-145,147	K22170805	" " " 0.001μF B (C2012B1H102MFA)
Q105	G3327127G	2SC2712GR-TE85R			
Q106	G3070001	FA1A4M			
Q107	G3335857	2SC3585-T2B			
Q108	G3329547	2SC2954-T2B	C141,146	K10176102	Ceramic disc " 0.001μF " (DD104B102K50)
			C107,138	K22170817	Chip Ceramic " 0.01μF " (C2012B1H103MFA)
					DIODE
D101	G2090277	1SS205	C132	K22171006	" " " 0.022μF F (C2012F1H223ZFA)
				K22171008	" " " 0.047μF "
					(C2012F473ZFA)
			C110,111,113,116 120	K22141904	" " " 25WV 0.1μF D (C3216D1E104MFA)

C122	K78130001	Chip Tantalum 20WV 0.47µF (F951D474MRAAF1Q2)	D301,302	G2070007	DIODES 1SS226TE85L
C114,119,124	K40129052	Electrolytic 16WV 10µF (RC3-16V100M)			
C115,125	K40129038	" " 100µF (RC2-16V101M)	X301	H0102774	CRYSTAL UM-1 22.055MHz
C118	K40089020	" " 6.3WV 100µF (RC3-6V101M)			
C117	K40089010	" " 220µF (RC2-6V221M)			
			CD301	H7900260	CERAMIC DISCRIMINATOR D455C
		TRIMMER CAPACITOR			RESISTORS
TC101	K91000100	ECR-GA020E30 20pF	R305	J24205101	RMC 1/10T 101J 1/10W100Ω
			R304	J24205471	" " 471J " 470Ω
			R301	J24205122	" " 122J " 1.2kΩ
			R311	J24205152	" " 152J " 1.5kΩ
		INDUCTORS	R307,308	J24205222	" " 222J " 2.2kΩ
L101	L1190287	LAL02NA2R2K 2.2µH	R314	J24205392	" " 392J " 3.9kΩ
L102	L1690001	LQN2A10NM 0.01µH	R315	J24205472	" " 472J " 4.7kΩ
L103	L0020875A		R313	J24205682	" " 682J " 6.8kΩ
L104	L0021532		R316	J24205103	" " 103J " 10kΩ
			R303,310	J24205473	" " 473J " 47kΩ
			R306	J24205683	" " 683J " 68kΩ
			R302	J24205224	" " 224J " 220kΩ
		CAVITIES	R312	J24205474	" " 474J " 470kΩ
CV101 Model A	L4020069	HF-63H21 460MHz			
					CAPACITORS
		CONNECTORS	C303	K22170217	Chip Ceramic 50WV 18pFCH (C2012CH1H180JFA)
J101	P0090599	IL-Y-5P-S15T2-EF			" " " 56pF "
J102	P0090601	IL-Y-14P-S15T2-EF	C304,310	K22170229	(C2012CH1H560JFA)
J103	P0090598	IL-Y-4P-S15T2-EF			" " " 120pF "
P101 (with wire)	T9205436		C305	K22170237	(C2012CH1H121JFA)
					" " " 150pF "
		CORE	C309	K22170239	(C2012CH1H151JFA)
	L9190045	FR6.3X3.0X2.2	C302,314	K22170805	" " " 0.001µF B (C2012BH1H102MFA)
			C301,312,317	K22170817	" " " 0.01µF " (C2012BH1H103MFA)
		FERRITE BEADS	C307,308,313	K22141904	" " 25WV 0.1µF D (C3216D1E104MFA)
	L9190001	4A RI3X3-1	C316,318	K78120013	Chip Tantalum 16WV 1µF (F951A105MRAAF1Q2)
			C311	K78080004	" " 6.3WV 15µF (F950J156MVCAF1Q2)
IF UNIT					
Symbol No.	Part No.	Name & Description			
	F2840102	Printed Circuit Board			
	C028402AB	PCB with Components			INDUCTOR
			L301	L1190343	LAL02KR4R7K 4.7µH
		IC			
Q302	G1090698	TK10420M			
			PLL UNIT		
			Symbol No.	Part No.	Name & Description
		TRANSISTOR		F2840108A	Printed Circuit Board
Q301	G3326207B	2SC2620QBTR		C028408AC	PCB with Components

		ICs			TRANSISTORS
Q401	G1090708	MC12018	Q503	G3333567	2SC3356-T2B
Q402	G1090582	JLC1007P	Q502	G3335857	2SC3585-T2B
			Q501	G3335857	2SC3585-T2B
				D/E	
		DIODE			
D401	G2090027	1SS53 Si			DIODES
			D501,502	G2070035	1T32-T8
		CRYSTAL			RESISTORS
X401	H0102799	UM-2 12.8MHz	R512	J24205150	RMC1/10T 150J 1/10W 15Ω
			R502	J24205470	" " 470J " 47Ω
			R510	J24205471	" " 471J " 470Ω
			R503,508	J24205222	" " 222J " 2.2kΩ
			R509	J24205472	" " 472J " 4.7kΩ
			R501,504-507	J24205103	" " 103J " 10kΩ
		RESISTORS	R511	J24205683	" " 683J " 68kΩ
R408	J24205150	RMC 1/10T150J 1/10W 15Ω			
R402,403	J24205220	" " 220J " 22Ω			
	J24205221	" " 221J " 220Ω			
R409	J24205102	" " 102J " 1.0kΩ			CAPACITORS
R405,407	J24205222	" " 222J " 2.2kΩ	C506,511	K22170202	Chip Ceramic 50WV 1pF CH (C2012CH1H010CFA)
R406	J24205103	" " 103J " 10kΩ	C512	K22170203	" " " 2pF " (C2012CH1H020CFA)
R404	J24205223	" " 223J " 22kΩ	C511,513	K22170204	" " " 3pF " (C2012CH1H030CFA)
		CAPACITORS	C514	K00172050	Ceramic disc " 5pF " (DD104SL050C50)
C401	K22170204	Chip Ceramic 50WV 3pF CH (C2012CH1H030C50)	C509	K22170206	" " " 5pF " (C2012CH1H050DFA)
C412	K22170219	" " " 22pF " (C2012CH1H220JFA)	C507	K22170208	" " " 7pF " (C2012CH1H070DFA)
C411	K22170231	" " " 47pF " (C2012CH1H470JFA)	C510	K22170209	" " " 8pF " (C2012CH1H080DFA)
C408-410	K22170235	" " " 68pF " (C2012CH1H680JFA)	C501	K22170315	" " " 15pF UJ (C2012UJ1H150DFA)
C402,403,405,407 413-415	K22170805	" " " 0.001μF B (C2012B1H102MFA)	C502,504,505,508	K22170805	" " " 0.001μF B (C2012B1H102MFA)
C416,417	K22141904	" " 25WV 0.1μF D (C3216D2E104MFA)	C503	K78080004	Chip Tantalum 6.3WV 15μF (F950J156MVCAP1Q2)
C404,406	K78080002	Chip Tantalum 6.3WV 4.7μF (F950J475MSAAF1Q2)	C515	K70087336	Tantalum 6.3WV 33μF (DN0J330M1S)
C418	K78100003	" " 10WV 6.8μF (F951A685MTAAF1Q2)			
					TRIMMER CAPACITORS
		TRIMMER CAPACITOR	TC501,502	K91000153	TZB04Z030BA 3pF
TC401	K91000154	ECR-KN020E11 20pF			
			L501	H7900320	CERAMIC RESONATOR DRS064UE190P
		INDUCTOR			
L401	L1190311	LAL02NA221K 220μH			INDUCTOR
			L502	L1190342	LAL02KRR22M 0.22μH
					TERMINAL POSTS
				Q5000082	IPS-1091
VCO UNIT					
Symbol No.	Part No.	Name & Description			
	F2840106	Printed Circuit Board			
	F2840110	" " "		R0116640A	SHIELD CASE
				R0117110	SHIELD LID
	C028406AD	PCB with Components		R0117120A	SHIELD REAR

[illegible]

ANT SW UNIT			CNTL UNIT		
Symbol No.	Part No.	Name & Description	Symbol No.	Part No.	Name & Description
	F2840107A	Printed Circuit Board		F2840105A	Printed Circuit Board
	C028407AB	PCB with Components		C028405AE	PCB with Components
		TRANSISTORS			
Q901,903,905,906	G3327127G	2SC2712GRTE85R			
Q902,904	G3207997L	2SB799ML			
		DIODES			ICs
D901	G2090027	1SS53 Si	Q1001	G1090767	HD613901A78
D902	G2090277	1SS205 Si	Q1007	G1090752	PST523G
D903	G2070007	1SS226 TE85R Si	Q1008	G1090602	μPD4066BG
			Q1009	G1090601	μPD4001BG
		RESISTORS			
R905	J24205331	RMC 1/10T331J 1/10W330Ω			TRANSISTORS
R902	J24205102	" " 102J " 1kΩ	Q1002,1012	G3111627G	2SA1162GRTE85R
R903,909,910	J24205222	" " 222J " 2.2kΩ	Q1003-1006,1010	G3327127G	2SC2712GRTE85R
R907	J24205103	" " 103J " 10kΩ	Q1011	G3070001	FA1A4M
R904	J24205223	" " 223J " 22kΩ			
R901	J24205333	" " 333J " 33kΩ			
R906,908	J24205104	" " 104J " 100kΩ			
			D1001,1002,1008	G2070001	DIODES 1SS181TE85R .Si
			D1003,1005	G2090334	HZ4ALL Zener
		CAPACITORS	D1004	G2090118	1SS97 Schottky
C920	K22170202	Chip Ceramic 50WV 1pF CH (C2012CH1H010CFA)	D1006	G2070028	SLM-23VMW T-97 LED
C908,921	K22170204	" " " 3pF " (C2012CH1H030CFA)	D1007	G2070009	1SS184TE85R Si
C910	K22170207	" " " 6pF " (C2012CH1H060DFA)			
C913	K22170208	" " " 7pF " (C2012CH1H070DFA)			RESISTORS
C911,912,919	K22170209	" " " 8pF " (C2012CH1H080DFA)	R1040	J24205221	RMC 1/10T 221J 1/10W220Ω
C914	K22170211	" " " 10pF " (C2012CH1H100DFA)	R1027,1037	J24205471	" " 471J " 470Ω
	K22170217	" " " 18pF " (C2012CH1H180JFA)	R1016,1017	J24205561	" " 561J " 560Ω
C901,903,905-907 909,916,918	K22170805	" " " 0.001μF B (C2012B1H102MFA)	R1029	J24205102	" " 102J " 1kΩ
C902	K40179033	Electrolytic 16WV 0.47μF (RC3-50VR47M)	R1019,1036	J24205152	" " 152J " 1.5kΩ
C904,917	K40129052	" " " 10μF (RC3-16V100M)	R1035	J24205222	" " 222J " 2.2kΩ
			R1012,1020,1038	J24205472	" " 472J " 4.7kΩ
			R1011,1015,1018 1021-1024,1033 1034,1039	J24205103	" " 103J " 10kΩ
			R1028	J24205183	" " 183J " 18kΩ
			R1010,1025,1031	J24205473	" " 473J " 47kΩ
				J24205823	" " 823J " 82kΩ
			R1001,1002,1013 1014,1026,1030	J24205104	" " 104J " 100kΩ
			R1032	J24205224	" " 224J " 220kΩ
			R1009	J24205105	" " 105J " 1MΩ
				J24205155	" " 155J " 1.5MΩ
		INDUCTORS			
L901	L1190342	LAL02KRR22M 0.22μH			POTENTIOMETER
L902,903	L0021531				RVG4F03103TG 10kΩ
L904,905	L0020875A				
L906	L0021263				
		TERMINAL POSTS			
TP901	Q5000016	TP-E			

		CAPACITORS			RUBBER CONDUCTOR
C1004,1005	K10176101	Ceramic disc 50WV 100pF B (DD104B101K50)		S2000026	24.3×1.8×1 SS
C1011-1016,1019 1022,1024-1027 1030-1032	K22170805	Chip Ceramic " 0.001μF " (C2012B1H102MFA)			
C1033,1034	K22171801	" " " 0.001μF " (C3216B1H102MFA)	BAT1001	Q9000366	LITHIUM BATTERY CR2025
C1028,1035,1036	K10176102	Ceramic disc " 0.001μF " (DD104B102K50)			
	K22170809	Chip Ceramic " 0.0022μF " (C2012B1H222MFA)			LIQUID CRYSTAL DISPLAY LR541-C
C1018	K22170817	" " " 0.01μF " (C2012B1H103MFA)	DS1001	G6090060	
C1039	K22141902	" " 25WV 0.047μF D (C3216D1E473MFA)			
	K22170821	" " " 0.0022μF B (CM21W5R223M50VAT)		L9190001	FERRITE BEADS 4A RI3×3-1
C1037,1038	K22171002	" " " 0.0047μF F (C2012F1H472ZFA)			
C1023,1007-1010	K22141904	" " " 0.1μF D (C3216D1E104MFA)			
C1021	K40089010	Electrolytic 6WV 220μF (RC2-6V221M)	ACCESSORIES*		
C1017	K78100003	" " " 6.8μF (F951A685MTAAF1Q2)	Symbol No.	Part No.	Name & Description
C1020,1029	K78080003	" " 6.3WV 10μF (F950J106MTAAF1Q2)		Q3000016	ANTENNA FHA-7X
C1006	K70087106	Tantalum 6.3WV 10μF (DN0J100MIS)			
				S6000098	HAND STRAP
		CONNECTORS			BATTERY PACK*
P1001 (with wire)	T9205448			D3000509	FNB-12
P1002 (with wire)	T9205433				
					VINYL SOFT CASE*
		CERAMIC RESONATOR		S6000120	CSC-28 u/w FNB-12
X1001	H7900270	CSB800K		S6000121	CSC-29 u/w FNB-12, FTT-4
		BUZZER			* Optional same models
BZ1001	M4290001	EFBRE-25D02			
		SPEAKER			
SP1001	M4090063	TO36S13Y2611			
		MIC			
MIC1001	M3290008	EM-78CYE			
		SWITCHES			
S1001,1002	N5090018	KHH15951 SQL OFF*, PTT			
S1003	N6090063	SSSS22050A			
S1004	N4090088	SPJ622NO9 HI/LO			
S1005	N0190139	SRBMIL066 DIAL			
		CONNECTORS			
J1001	P1090369	HSJ0838-01-010 MIC			
J1002	P1090370	HSJ0836-01-010 EAR			

* Models D,DK

NC-29

MAIN CHASSIS			R108	J30375220	Cement 5W 22Ω
Symbol No.	Part No.	Name & Description	R109	J30375390	" " 39Ω
		POWER TRANSFORMER			
PT01	L3030124B				
			VR101	J51723474	POTENTIOMETER H1051A023-470KB 470kΩ B
		FUSE HOLDER			
F01 (with wire)	T9205443				
			C101	K40149002	CAPACITORS Electrolytic 25WV 470μF (RE-25V471M)
		AC POWER CORD	C102, 103	K40129004	" 16WV 10μF (RE-16V100M)
	T9000180	2 wire, 2 prong plug			
	T9000482	3 wire, 3 prong plug (UL)	C104	K70127106	Tantalum 16WV 10μF (DN1C100MIS)
	T9000684	3 wire, 2 prong EU plug			
	T9000680	3 wire, 3 prong Australian plug			
			RL101	M1190002	RELAY FBR211AD012M
		MISCELLANEOUS			
	R3900140	Case			
	R0508960	Chassis			
	R0109630	Holder			SWITCH
	R0118710	Lever Spring	S101	N7090018	AH2544
	S4000016	Foot			
					TEST POINT
			TP101	Q5000051	TP-L
	F2858000A	Printed Circuit Board			
	C028580A	PCB with Components			
		ICs			
Q101	G1090507	μPC78L12A			
Q102	G1090759	AN6781			
		TRANSISTOR			
Q103	G3318150G	2SC1815GR			
		DIODES			
D101	G2090079	S2VB10 Si			
D107, 108	G2090306	10E1 "			
D106, 109-112	G2090027	1SS53 "			
D105	G2090136	TLG205 LED			
D102-104	G2090137	TLR205 "			
		RESISTORS			
R101	J01275150	Carbon Film 1/2W 15Ω TJ			
R106	J02245681	" " 1/4W 680Ω SJ			
R112	J01275821	" " 1/2W 820Ω TJ			
R103-105	J01245122	" " 1/4W 1.2kΩ "			
R113	J01245222	" " " 2.2kΩ "			
R107	J02245103	" " " 10kΩ SJ			
R102	J02245394	" " " 390kΩ "			
R110	J20336151	Metallic Film 2W 150Ω			
R111	J20306471	" " 1W 470Ω			

FYG-3U

MAIN CHASSIS					RESISTORS
Symbol No.	Part No.	Name & Description			
			R303, 304	J01215103	RD18TJ103 Carbon Film 1/8W 10K (TJ)
		SWITCH			
S1	N2090027	8J 1011 Power	R301, 302, 311	J24205104	RMC 1/10T 104J Chip 1/10W 100kΩ
	R3508110	Knob	R305, 310, 317	J24205472	" " 472J Chip 1/10W 4.7kΩ
	R3116390	"	R306	J24205105	" " 105J Chip 1/10W 1MΩ
	R3101731	"			
	R3508310	"	R307, 312	J24205473	" " 473J Chip 1/10W 47kΩ
			R308, 314, 315, 318, 319	J24205103	" " 103J Chip 1/10W 10kΩ
MOTHER BOARD			R313	J24205224	" " 224J Chip 1/10W 220kΩ
	F2838104A	PCB	R316	J24205152	" " 152J Chip 1/10W 1kΩ
		CONNECTOR	R309	J24205000	" " 000J Chip 1/10W 0Ω Chip Jumper
J101	P0090603	IL-Y-02P-S15TZ-EF 2p			
REG UNIT					
	F2838109A	PCB			
		IC	VR301	J51771103	POTENTIOMETER PVG4F03-103VM-TG 10kΩ Chip
Q201	G1090736	LVC 550C-Z			
		CAPACITORS			CAPACITORS
C201, 204	K22170805	Chip Ceramic 50WV 0.001μF B (C2012B1H102MFA)	C301, 302	K22170813	Chip Ceramic 50WV 0.0047μF (B) C2012B472MFA
C202	K78120002	Tantalum 16WV 2.2μF (F951C225MSAAF1QZ)	C303, 304	K22170235	" " 50WV 100PF(CH) C2012CH1H102JFA
C203	K78120003	" 6.3V 10μF (F950J106MTAAF1QZ)	C306-309	K22141904	" " " 0.1μF (D) C3216D1E104MFA
			C310-313	K22170805	" " " 0.001μF (B) C2012B1H102MFA
CNTL UNIT			C305	K78080002	Chip Tantalum 6.3V 4.7μF F950J475MSAAF1QZ
	F2838105A	PCB	C315	K78100003	" " 10V 6.8μF F951A685MTAAF1QZ
		ICS			
Q301	G1090767	HD613901A78			
Q304	G1090771	LC4001BM			
Q305	G1090752	PST523G-2			BUZZER
Q306	G1090772	LC4066BM	BZ301	M4290001	EFBRE-25D02 Buzzer
		TRANSISTORS			SWITCHES
Q302	G3327127G	2SC2712GRTE85R	S301	N0190139	SRBMIL066 DIAL
Q303	G3111627G	2SA1162GRTE85R	S302	N5090018	KHH15951 PTT
			S303	N4090088	SPJ622N09 CLONE
		DIODES			LITHIUM BATTERY
D301	G2090334	HZ4AALL Zener			
D302	G2090118	1SS97 Schottcky	BAT301	Q9000366	CR2025-WT6
D303	G2070009	1SS184TE85R Si			
		LIQUID CRYSTAL DISPLAY		S2000026	RUBBER CONDUCTOR 24.3×1.8×1.0SS
DS301	G6090060	LR-541C LCD			
					CONNECTORS
		CERAMIC RESONATOR	P301	T9205483	with wire
X301	H7900270	CSB800K	J301	P1090369	HSJ0838-01-010
			J302	P1090370	HSJ0836-01-010

